

Exploring Pathways for Ecological Resource Value Transformation in the Northern Ecological Development Zone of Guangdong Province

Hailing Jiang*

Zhongkai University of Agricultural and Engineering, Guangzhou, Guangdong, China

**Corresponding Author*

Abstract: This study examines typical cases and successful experiences of ecological resource value transformation abroad. Based on the specific circumstances of the Northern Ecological Development Zone, it proposes a path for achieving ecological resource value transformation in the Northern Ecological Development Zone of Guangdong Province: utilizing multiple models and developing according to local conditions; focusing on local resources and introducing specialized industries; leveraging regional advantages to attract health and wellness professionals; and developing ecological agriculture to achieve product premiums.

Keywords: Ecological Resources; Ecological Industry; Ecological Compensation; Typical Case; Conversion Path

1. Introduction

Since the late 20th century, Europe and the United States have conducted extensive research on ecological resource value transformation, resulting in a number of exemplary cases in ecological industrialization, ecological compensation, ecological resource indicators, and property rights transactions [1,2]. The Northern Ecological Development Zone of Guangdong Province is a key component of the "One Core, One Belt, One Region" regional development framework. While possessing significant ecological resource advantages, its economic and social development has lagged behind. This study examines typical cases and successful experiences in transforming the value of ecological resources abroad. Combining the ecological resource endowment characteristics, development foundation, and conditions of the Northern Ecological Development Zone, it provides guidance based on different application scenarios, promotes and replicates advanced

experiences, and continuously deepens practice to create a number of Guangdong models for transforming the value of ecological resources that align with ecological advantages and realize ecological value in diverse forms [3].

2. Typical Cases of Transforming the Value of Ecological Resources Abroad

2.1 Typical Cases of Ecological Industrialization.

Switzerland, leveraging its abundant water resources and beautiful natural landscapes, develops ecological industries such as green energy and ecotourism. Regarding green energy, Switzerland implements a "green hydropower" certification system, using "green hydropower" as a starting point for addressing the relationship between river ecology and hydropower production. Switzerland has transformed the country into a "battery" for peak load regulation in the European power grid. With hydropower accounting for 90% of the national power mix, Switzerland is known as the "Hydropower Kingdom." Regarding tourism, Switzerland focuses on organically integrating local culture, historical sites, and natural landscapes to create distinctive tourism and cultural brands. The country has developed diverse tourism products such as convention and exhibition tourism, forestry tourism, agricultural tourism, and business tourism. Tourism has become the country's third-largest pillar industry.

Eco-product certification is key to realizing an ecological premium in eco-product transactions. Eco-labeling systems abroad have standardized this process [4]. Eco-labeling is a label awarded to environmentally friendly products and services. In a consumer environment characterized by growing environmental awareness, labeled products are more likely to be recognized by consumers than other products, facilitating the

monetization of ecological value [5]. In 1978, the United Nations first proposed the "Blue Angel" eco-label, followed by numerous countries launching their own and regional eco-labels. The US "Energy Star" is currently a highly influential eco-label worldwide. The European Union established its eco-labeling system in 1992, and over 70,000 products and services have been certified. The Forest Stewardship Council, an international public welfare organization, has certified 3 billion mu (approximately 1.6 hectares) of forests and their products in 85 countries, including forest products, agricultural products, and ecotourism products [6].

2.2 Typical Cases of Eco-Compensation

The US Wetland Mitigation Bank (WMB) is a market-based compensation model for realizing ecological value [7]. Its core is the legally defined "zero net loss" management goal for wetland resources, along with strict government control mechanisms. It also establishes institutional rules that allow for "compensatory mitigation," thereby stimulating demand for wetland compensation transactions and fostering a trading market where third parties construct and maintain wetlands [8]. This model has flourished in the US, with over 3,000 WMBs to date. WMBs restore damaged wetlands, construct new wetlands, enhance certain functions of existing wetlands, or preserve wetlands and other aquatic resources within one or more geographic areas. These wetlands are then sold on credit at reasonable market prices to wetland developers (occupiers, destroyers, etc.), thereby compensating for wetland damage. The government approval and regulatory bodies for this mechanism primarily include the U.S. Army Corps of Engineers and the Environmental Protection Agency. Purchasers are developers who damage wetlands, including individuals, businesses, or government departments at all levels (including the military). Sellers are generally wetland mitigation bank builders and ecological restoration companies, including private companies that establish and manage mitigation banks, local government agencies, individual landowners, and investment funds or companies that include wetland mitigation banking as part of their investment portfolios. The wetland mitigation bank model not only protects wetland ecological functions but also promotes the conversion of ecological and

economic value.

Madford Farm in the United States utilizes a combination of approaches and measures to realize the value of ecological products [9]. For agricultural products and tourism and hunting services that can be directly traded on the market, their value is realized through market-based methods. For public goods like clean water and wetland ecosystem services, the government is leveraging the trading market created by government regulation to promote the trading of various indicators, such as wetland credits and water quality credits, thereby highlighting their ecological value. Furthermore, the government is actively participating in the US "Land Fallow Enhancement Program" and receiving government subsidies. This is essentially a form of ecological compensation. Farms implement fallow and ecological restoration to increase the supply of ecological products, and the government "purchases" the farms' ecological products through subsidies, fostering a profit cycle where "protectors benefit and users pay."

Costa Rica has established a market mechanism for ecological compensation and established a dedicated agency, the National Forest Fund. This agency raises funds through a variety of channels, including state investment, agreements with private enterprises, projects, and market instruments. It purchases ecological products such as water conservation, ecological carbon sequestration, biodiversity, and ecotourism through environmental service licenses. This has greatly mobilized public enthusiasm for ecological protection and development, increasing the country's forest coverage from 21% in 1986 to 52% in 2012. Costa Rica's market-based compensation model, where the government purchases ecological products, has commercialized forest protection, promoted poverty alleviation for farmers, and redistributed resources, becoming a successful international model for ecological compensation [10].

2.3 Ecological Resource Indicators and Property Rights Trading

Australia has introduced an ecological bank mechanism in the field of biodiversity conservation. The core of this mechanism is ecological credits and their trading market. Private landowners establish ecological bank reserves on their land and sign an ecological bank agreement with government authorities, agreeing to increase the ecological value of the

area through strengthened management and protection. In return, they earn ecological credits [11]. Landowners can sell credits to obtain funds for managing the ecological bank reserves [12]. Developers can purchase credits to compensate for the ecological impacts of their development projects, and other organizations can also purchase credits for ecological conservation purposes [13].

Australia has developed an agricultural soil carbon sequestration project and established rigorous baseline sampling, carbon sequestration measurement, and project operation mechanisms [14]. Market transactions are conducted through "reverse auction" rules. These practices transform ecosystem carbon sequestration services into tradable carbon sink products, contributing to the comprehensive benefits of ecological products [15,16].

Germany's ecological accounting system is a model for realizing ecological value that combines government regulation with market transactions. The government has legally mandated that "impacts on natural ecosystems must be compensated" and established rules for the assessment, registration, use, and trading of ecological accounts and ecological credits. This has created a market where occupiers or third parties can establish ecological accounts, earn ecological credits, and conduct transactions. Essentially, it transforms ecosystem services, which are difficult to trade due to their public nature, into directly tradable ecological credits or indicators, thereby promoting the realization of ecological value. In its ecological value accounting process, Germany uses an "indexation" approach to convert ecosystem service values into ecological credits, rather than a "monetary" approach. This avoids the misconception of "calculating how much, how much value" and lays the foundation for the allocation of ecological products through market forces.

3. Policy Recommendations for Ecological Resource Transformation in the Northern Ecological Development Zone

Leveraging the unique ecological, agricultural, and cultural resources and advantages of the Northern Ecological Development Zone, drawing on advanced domestic and international experience, and centering on the region's primary functional positioning, we will strengthen green leadership and adhere to distinctive development.

We will actively explore sustainable pathways for ecological resource transformation that are government-led, involve businesses and all sectors of society, and are market-oriented. We will promote institutional innovation, build an institutional platform for ecological resource transformation, enhance the endogenous driving force of regional development, and promote high-quality development.

3.1 Utilize Multiple Models and Develop According to Local Conditions.

Except for key ecological functional zones with extremely sensitive environmental conditions, most regions that have successfully transformed ecological resources have not achieved success through a single model. Ecotourism, eco-agriculture, and eco-culture, in particular, often require integrated development. For example, Wuyuan, Tonglu, and Daocheng all employ a combination of cultural tourism and scenic beauty, complementing lush mountains and clear waters with distinctive culture and even modern technology to attract visitors. The tea gardens of Wuyishan City, Fujian, while developing eco-agriculture, also strive to attract tourists with their beautiful ecological environment and tea culture. Regencies in the northern ecological development zone should promote green development in the primary and secondary industries while leveraging the restored ecological environment to actively develop large-scale tourism.

3.2 Focus on Local Resources and Introduce Distinctive Industries

To avoid homogenous competition, regions in northern Guangdong should deeply explore their unique cultural heritage and strive for differentiated development. For example, the Lishui Guyan Painting Village became associated with painting due to the influx of painters who visited the area in the 1980s. Seizing this opportunity, the local community introduced galleries and other businesses, creating an oil painting industry with a production value exceeding 100 million yuan. Regions in northern Guangdong possess unique religious or folk cultures. For example, the hometown of the Sixth Patriarch in Xinxing, Yunfu, could leverage Zen Buddhism to develop related cultural industries. The Liannan Yao region could leverage the province's limited minority cultural resources to develop various

cultural experience activities, achieving differentiated development from other tourist destinations [16].

3.3 Leverage its Locational Advantages to Attract Health and Wellness Travelers

Northern Guangdong borders the economically developed Pearl River Delta region. With rising demands for quality of life and an aging population, enormous opportunities in the healthcare sector are within reach. For example, Qingyuan, with its abundant hot springs and forest resources, could draw on the experience of Wudang and Guangyuan, collaborate with medical institutions and nursing homes in the Pearl River Delta, and even recruit professionals in sports and mental health to vigorously develop a "comprehensive health + ecological healthcare" industry.

3.4 Develop Ecological Agriculture to Achieve Product Premiums.

Northern Guangdong could learn from the experience of Wuyishan and capitalize on the unique local ecological products to develop ecological agriculture. Based on standardized and high-end agricultural production, drawing on the experience of Chongyi, Jiangxi, it could support leading enterprises and engage in intensive processing, achieving the development of an "ecological+" complex industry [17]. Furthermore, it could learn from the experience of Lishui, Zhejiang, benchmarking agricultural production against high international standards, integrating scattered agricultural production resources to form a regional public brand, and leveraging this brand image to achieve premiums for ecological products.

4. Comprehensive Supporting Measures for the Transformation of Ecological Resource Value in the Northern Ecological Development Zone

4.1 Effectively Transforming Concepts and Raising Awareness

The Pearl River Delta region should deeply recognize that the five cities in northern Guangdong have paid enormous ecological protection costs and development opportunity costs for the province's ecological security. As beneficiaries of ecological protection, they should proactively assume greater responsibility for ecological protection compensation and

support the accelerated development of the northern ecological development zone through various means such as targeted assistance, industrial transfer, and joint park construction. The five cities in northern Guangdong should deeply recognize that a good ecological environment holds immense wealth. They should actively shoulder the primary responsibility for strengthening ecological barriers, appropriately and orderly absorb industrial spillover from the Pearl River Delta Region, actively open up channels for the transformation of ecological resource value, focus on building an ecological industrial system, and accelerate integration into the Greater Bay Area [18].

4.2 Continue to Strengthen Ecological and Environmental Protection

Coordinate the development of ecosystems such as mountains, rivers, forests, farmlands, lakes, and grasslands, organize and implement major ecosystem restoration projects, establish a natural conservation area system with national parks as the core, and strengthen the ecological foundation of the northern ecological development zone. Strengthen urban and rural living environment improvements in the five cities of northern Guangdong, improve centralized sewage treatment facilities in county towns and villages, and strengthen urban and rural domestic waste collection, transportation, and disposal systems. Develop beautiful villages with Lingnan characteristics, fully tap into and scientifically utilize the favorable ecological environment, and leverage ecological empowerment to efficiently promote high-quality development of the "beautiful economy" in the northern ecological development zone. Establish and improve a benefit-oriented mechanism for ecological and environmental protection based on the principle of "protectors benefit, users pay, and destroyers compensate."

4.3 Improve the Green Development Assessment System

Relevant provincial departments will lead a pilot program for a dual GEP and GDP assessment mechanism in all prefecture-level cities in the Northern Ecological Development Zone. A mechanism will be implemented in key national and provincial ecological function zones (counties) to assess only GEP, not GDP. GEP and per capita GEP indicators will be incorporated into the Northern Ecological

Development Zone's high-quality development evaluation index system. GEP calculation results will serve as a key reference for cadre performance appraisals, exit audits of natural resource assets, and fiscal reward and subsidy policies. An annual work plan for transforming the value of ecological resources in the Northern Ecological Development Zone will be formulated, and its completion will be included in the annual assessments of various departments, cities, and counties. In conjunction with the policy direction of shifting from a "dual control" assessment of energy consumption to a "dual control" assessment of total carbon emissions and intensity, preferential assessment policies will be implemented in the Northern Ecological Development Zone as appropriate.

4.4 Improve Transportation and Other Infrastructure

Accelerate the development of the northern ecological development zone's urban and rural transportation backbone network, strengthen rapid transit connections with the Pearl River Delta Region, the coastal economic belt, and neighboring provinces and cities, and promote "inbound access, outbound delivery, and investment by businesses." Coordinate the planning of tourist highway construction, improve the tourist transportation network connecting key scenic spots, and open up the "last mile" of tourist transportation. The current rural road standards in our province are relatively low, unable to meet the needs of rural residents, the export of agricultural products, and the development of rural tourism. Building on the previous construction of "Four Good Rural Roads," we must further promote the upgrading and renovation of rural roads.

5. Conclusion

The northern ecological region of Guangdong Province is an important part of the regional pattern of "one core, one belt and one area", with obvious advantages in ecological resources, but its economy and society are relatively lagging behind. This study combs some typical cases and successes of the value transformation of ecological resources abroad, combined with the actual situation of the northern ecological region, puts forward the ways to realize the value transformation of ecological resources in the northern ecological region of Guangdong Province: multi-use, adapting measures to local

conditions; Focus on local resources and introduce characteristic industries; Take advantage of the location to attract the flow of health care people; Ecological agriculture, realizing product premium, etc. At the same time, it is suggested that departments can provide comprehensive supporting measures from the aspects of changing concepts, raising awareness, strengthening ecological protection, improving the green assessment system, and improving infrastructure construction such as transportation.

Acknowledgements

This work was supported by 2024 Guangdong Youth Research Project: Research on the practical path of young people's participation in green and beautiful ecological construction under the perspective of the "Hundreds of Millions of Projects" - Taking the Northern Ecological Development Zone as an example (No. 2024WT019).

References

- [1] Guihuan L, Ya M, Yihui W, et al. Comparison on Eco-Compensation between the Domestic and International Studies. *Journal of Resources and Ecology*, 2018, 9(4): 382-394.
- [2] Shang W, Gong Y, Wang Z, et al. Eco-compensation in China: Theory, practices and suggestions for the future. *Journal of Environmental Management*, 2018, 2(1): 162-170.
- [3] Xu L, Liu X, Gatto A, et al. Valuation of ecosystem services from forests in Chinese rural areas based on forest resource investment. *Humanities and Social Sciences Communications*, 2025, 12(1): 83-95.
- [4] Rahman N, Rabetino R, Rajala A, et al. Prosumer flexibility as an enabler for ecosystem value co-creation: A resource integration approach from the Finnish electricity markets. *Applied Energy*, 2025, 3(2): 125-138.
- [5] Valtteri K, Anu H. Human-AI resource relations in value cocreation in service ecosystems. *Journal of Service Management*, 2025, 36(2): 291-306.
- [6] Cork L J, Luhtala M. Value co-destruction through misintegration of resources within a public service ecosystem. *Public Management Review*, 2025, 27(3): 722-745.
- [7] Popescu C, Stanescu D M. Eco-Friendly Processing of Wool and Sustainable

- Valorization of This Natural Bioresource. *Sustainability*,2024,16(11):501-523.
- [8] Roberts J C, Vergés A, Poore B G A. A new resource for monitoring reef ecosystems: The background of recreational diver photographs contains valuable habitat data. *Journal of Applied Ecology*,2023,60(12):2688-2698.
- [9] My D H N, Kien D N, Hung X P, et al. Does the Value of Water-Related Ecosystem Services Capture Water Scarcity? Application to Rice Farming in the Mekong Delta of Vietnam? *Water Economics and Policy*,2023,10(01):296-317.
- [10] Ana M, Leon M. Valuing surfing ecosystems: an environmental economics and natural resources management perspective. *Tourism Geographies*,2023,25(6):1602-1629.
- [11] Taylor C, Ashman K, Ward M, et al. Have significant biodiversity values been protected from industrial logging across Australia? *Conservation Science and Practice*,2025,7(8):89-108.
- [12] Luiz J O, Stratford D, Kopf K R. Environmental and Biological Drivers of Fish Beta Diversity and Tropical River Conservation in Northern Australia. *Diversity and Distributions*,2025,31(5):27-45.
- [13] Kindler S G, Kelly N, Carden T, et al. Educating and empowering Australians through a digital approach to biodiversity conservation. *Conservation Science and Practice*,2025,7(4):39-57.
- [14] Griffin P C, Hettiaratchi A, Miller R G, et al. A Window into Australasian Biobanking-Showcasing Innovation, Highlighting Conservation, and Embracing Diversity. *Biopreservation and biobanking*,2025,12(1):83-102.
- [15] Kim B, Melissa H, Christoph K, et al. Backing biodiversity: understanding nature conservation behaviour and policy support in Australia. *Biodiversity and Conservation*,2024,33(8-9):2593-2613.
- [16] Gao H, Lin T. How to Compensate Forest Ecosystem Services Through Restorative Justice: An Analysis Based on Typical Cases in China. *Forests*,2025,16(8):1254-1278.
- [17] Zhidong L, Didi R, Moucheng L. The Impact of China's Grassland Ecological Compensation Policy on the Income Gap between Herder Households? A Case Study from a Typical Pilot Area. *Land*,2021,10(12):1405-1426.
- [18] Qirong Z, Shaojun C, Xue L, et al. Hydroinformatics-driven ecological value creation framework: a study on ecosystem services Co-production in the Xinghua Duotion ecosystem, China. *Journal of Hydroinformatics*,2025,27(4):723-739.